*Hobbes and Fracastoro**

CEES LEIJENHORST

Introduction

A recent article in this journal[1] has adduced conclusive evidence that Thomas Hobbes was the author of the so-called *Short Tract*. This finally closes the debate on the paternity of the anonymous, undated manuscript which has been going on ever since Ferdinand Tönnies discovered it in the British Library at the end of last century. The *Short Tract* will now have to be taken into account by anyone studying the development of Hobbes's theoretical philosphy and its possible sources.

One of these sources is without doubt renaissance naturalism, as professed by philosophers such as Bernardino Telesio (1509-1588) and Tommaso Campanella (1568-1639). These authors try to understand nature by its own immanent principles (*iuxta propria principia*), rejecting supra-natural and metaphysical explanatory devices. They consider man as part of the universal natural framework, explaining his cognitive and volitional faculties by means of the general principles of natural philosophy. Moreover, their psychology shows very marked empiricist, even mechanistic tendencies. All these characteristics can be found in the *Short Tract* too.[2]

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[1] K. Schuhmann, "Le *Short Tract*, Première Oeuvre Philosophique de Hobbes," *Hobbes Studies* VIII (1995), 3-36.

[2] A comprehensive account of the relation between renaissance naturalism and Hobbes's philosophy in general and the *Short Tract* in particular is still a *desideratum*, though some work in this field has already been done. See K. Schuhmann, "Hobbes and Renaissance Philosophy," in *Hobbes Oggi*, ed. A. Napoli and G. Canziani (Milano 1990), 331-49; K. Schuhmann, "Hobbes and Telesio," *Hobbes Studies* 1 (1988), 109-33. In his in many ways still unsurpassed *Thomas Hobbes' Mechanical Conception of Nature* (Copenhagen and London, 1928), 385, F. Brandt states "if the little treatise [i.e. the *Short Tract*] is not intelligible from the study of Bacon, it is, as far as we can see, still less so, from a study of renaissance

In this article, I shall concentrate on a lesser known exponent of this tradition, viz. Girolamo Fracastoro (1475/6-1553). I will argue that Hobbes's account of sensible species and his psychology in the *Short Tract* were probably inspired by Fracastoro. I will try to substantiate this claim by making a comprehensive comparison between the natural philosophy and epistemology of Fracastoro and Hobbes. I will show that renaissance naturalism and seventeenth-century mechanicism have much more in common than has often been maintained.

1. Fracastoro's life and work

Girolamo Fracastoro (1475/6[3]-1553) is now mainly known as one of the first writers on epidemiology and more particularly as the author of a quasi-mythological didactical poem on the origin and cure of the dreaded "French disease", *Syphilis, sive de Morbo Gallico* (first edition Verona, 1530), a work so immensely popular that the name Fracastoro coined for the disease ultimately replaced the older term *morbus gallicus*.[4] In the sixteenth and seventeenth centuries, however, Fracastoro was not only known as the author of the *Syphilis*, but was also respected as a natural philosopher. William Gilbert calls him "the ingenious Fracastoro, an outstanding philosopher" (*ingeniosus Fracastorius philosophus eximius*)[5] and often refers, albeit in most cases in a critical manner, to Fracastoro's account of magnetism. Bacon refers to Fracastoro's theory of planetary

philosophers such as Fracastori [sic!], Telesio and Campanella... (Fracastoro's) statements about the external act of sense are very indefinite and obscure, on the other hand he maintains that sense perception is exclusively a suffering caused by the action of the object of sense." Brandt has already been proven wrong in the case of Telesio (cf. Schuhmann, "Hobbes and Telesio") and Campanella (see my "Motion, Monks and Golden Mountains: Campanella and Hobbes on Perception and Cognition," *Bruniana e Campanelliana* (forthcoming). In this article, I shall try to show that the great Danish Hobbes scholar is wrong too as far as Fracastoro is concerned.

[3] There is some doubt about the exact year of birth, but archival evidence seems to indicate that he was born in 1475 or 1476 (R. Brenzoni, "Documenti per la biografia di Girolamo Fracastoro," *Studi Storici Veronesi* 5 (1954). For Fracastoro's biography, see F. Pellegrini, *Fracastoro* (Triest, 1948), 17-46.

[4] There are more than one hundred editions and at least six translations of the poem. Cf. L. Baumgartner and J. Fulton, *A Bibliography of the Poem Syphilis* (Yale, 1935). The title *Syphilis* derives from Syphilus, a Greek shepherd's name freely invented by Fracastoro, in the same way as e.g. *Aeneis* derives from Aeneas. *Syphilis* therefore does not primarily denote a disease, but means "the poem of Syphilus". For a discussion of the etymology of the name, see G. Eatough, *Fracastoro's Syphilis* (Liverpool, 1984), 5ff.

[5] W. Gilbert, *De Magnete* (Londini, 1600), 5.

motion in the latter's *Homocentricorum sive de Stellis Liber.*[6] and to Fracastoro's cure for apoplexy[7], and Mersenne resumes his theory of resonance.[8]

Fracastoro was born in Verona. He studied mathematics and medicine in Padua, where Pomponazzi was one of his teachers. He became lecturer in logic in 1501 and a member of the council of physicians of his native city in 1505. From 1545 onwards he was one of the official physicians at the Council of Trent. He was accused of having been instrumental in temporarily moving the Council to Bologna under the false pretense that Trent was threatened by the plague, thereby benefiting the papal party.[9]

Fracastoro displayed the typical breadth of culture and interests of a renaissance humanist. He dabbled in botany, wrote tracts on the breeding and training of dogs and on the complexion of wine and composed a large poem on Joseph in Egypt. In this article, we will concentrate on Fracastoro's two main philosophical works, *De Sympathia et Antipathia* and *Turrius, sive de Intellectione.*[10]

[6] *The Works of Francis Bacon,* ed. J. Spedding and R.L. Ellis, vol. III (Stuttgart-Bad Canstatt, 1963), 719.

[7] *The Works,* 291. In his *Advancement of Learning* Bacon says: "Fracastorius, who, though he pretended not to make any new philosophy, yet did use the absoluteness of his own sense upon the old" (*Adv. of Learning*, Bk. II, Ch. VIII, ed. W. A. Wright (Oxford, 1921), 129.

[8] *Harmonicorum Libri*, vol. I (Paris, 1636), 65. In what follows, all references to Fracastoro's work will be given according to the posthumous Giunta-edition of his *Opera Omnia* (Venice, 1555). The name of the tract in question is in italics, followed by the page-number of the *Opera Omnia.*

[9] For this episode, see F. Pellegrini, *Fracastoro,* 39.

[10] Other interesting philosophical and scientific works include *Homocentricorum sive de Stellis Liber Unus* (1538) and *De Causis Criticorum Dierum Libellus* (1538). The first work (*Opera Omnia* 1-65D) develops a cosmology based on the assumption that the planets are fixed to material spheres, moving in perfect homocentric or concentric circles. With this theory, Fracastoro tries to overthrow the accepted Hipparchic doctrine of epicycles. This complex system was, however, soon to be overshadowed by Copernican cosmology and the theory of planetary movement devised by Kepler, who had nothing but contempt for Fracastoro's "dreams" (J. Kepler, *Gesammelte Werke,* ed. M. Caspar, vol. 15 (München, 1951), 146). Copernicus and Fracastoro were fellow students at Padua, but there is no evidence of a contact between the two future opponents (cf. F. Pellegrini, *Fracastoro*, 20). *De Causis Criticorum Dierum Libellus* (*Opera Omnia* 66-76D) demolishes the Galenic thesis that for each illness there are fixed critical days, a theory based on the assumption of certain imperceptible lunar influences (the so-called "occult qualities and operations") on the corporeal humors, which were supposed to follow a monthly rhythm. Further on, we will come back to Fracastoro's critique of occult qualities. On the *Homocentrica*, see E. Peruzzi, "Note e Ricerche sugli "Homocentrica" di Girolamo Fracastoro," *Rinascimento* 25 (1985), 247-269.

De Sympathia et Antipathia Liber Unus (1546)[11] is set up as a kind of general preface[12] to the subsequent work on contagious diseases[13], which propounds a more systematic elaboration of the theory of contagion already hinted at in the poem *Syphilis*. *De Sympathia et Antipathia* propounds an all-embracing philosophy of nature, which deals with such divergent topics as magnetism, the relation of elementary bodies to their natural places, and psychological themes such as hope, fear, joy and grief. All these phenomena are explained in terms of sympathy and antipathy, i.e. a certain agreement or disagreement in nature and qualities, making things attract and repel each other. The work has a distinctive naturalistic character which certainly might have appealed to Hobbes.

The *Turrius, sive de Intellectione* forms part of a series of dialogues which Fracastoro seems to have worked on over a relatively lengthy period.[14] Together, these dialogues could be seen as Fracastoro's philosophical anthropology[15] and psychology, discussing language, perception and cognition and man's immortality. The three dialogues are purportedly the off-shoot of a visit to Fracastoro's villa at Incaffi on the slopes of the Monte Baldo near Lago di Garda, where Fracastoro's friend Andrea Navagero is seized by a *poeticus figor*, and another friend, the astronomer Giambattista della Torre, is captured by a melancholic *stupor*. The first -and probably best-known- dialogue, *Naugerius sive de Poetica Dialogus*, expounds Fracastoro's poetics and views on language.[16] The *Fracas-*

[11] *Opera Omnia* 79-104. On *De Sympathia*, see E. Peruzzi, "Anti-occultismo e Filosofia Naturale nel *De Sympathia et Antipathia Rerum* di Girolamo Fracastoro," *Atti e Memorie dell'Acccademia Toscana delle Scienze e Lettere la Colombaria* 45 (1980), 41-131; G. Weidmann, *De Sympathia et Antipathia Liber Unus von Girolamo Fracastoro* (Ph.D. Diss. Zürich, 1979).

[12] *De Symp. et Ant.* 78A

[13] *De Contagionibus & Contagiosis Morbis & eorum Curatione Libri Tres.* This work on contagion and the *De Sympathia et Antipathia* were printed together in the first edition (Venice, 1546). The book on contagious diseases is considered to be one of the first systematic discussions of epidemiology. See Ch. & D. Singer, "The Scientific Position of Girolamo Fracastoro," *Annals of Medical History* 1 (1917), 1-34.

[14] On the *Turrius*, see S. Pearce, "Intellect and Organism in Fracastoro's *Turrius,*" in: *The Cultural Heritage of the Italian Renaissance: Essays in Honor of T.G. Griffith*, ed. C. Griffiths and R. Hastings (Lewiston / Queenston / Lampeter, 1993), 235-70; E. Cassirer, *Das Erkenntnisproblem in der Philosophie und Wissenschaft der neueren Zeit,* vol. I (Hildesheim, 1974), 226-232; P. Kondylis, *Die neuzeitliche Metaphysikkritik* (Stuttgart, 1990), 143-146 and L. Spruit, *Species Intelligibilis: From Perception to Knowledge,* vol. II (Leiden, 1995), 46-9. For a general discussion of Fracastoro's philosophy, see G. Saitta, *Il Pensiero Italiano nell'Umanesimo e nel Rinascimento*, vol. II (Bologna, 1950), 168-202.

[15] S. Pearce, "Intellect and Organism," 235.

[16] See G. Fracastoro, *Naugerius sive de Poetica Dialogus*, transl. R. Kelso, introd. M. W. Bundy (Urbana (Ill.), 1924). This translation has been severely criticized by D. Bigengiari, *Dante and Medieval Culture* (Florence, 1964), 65ff.

torius, sive de Anima Dialogus, which remained unfinished, discusses man's immortality. Doubtlessly the most important dialogue, or rather monologue,[17] is the *Turrius, sive de Intellectione*, which contains Fracastoro's doctrine of perception and cognition.[18] Hobbes never refers to this dialogue, nor for that matter to any other work by Fracastoro, which sets him apart from Bacon, Gilbert and Mersenne, authors Hobbes was very well acquainted with.[19] Nevertheless, his views on perception and cognition in the *Short Tract* seem to have been inspired to a considerable extent by Fracastoro's remarkable tract.

2. A sketch of Fracastoro's Natural Philosophy

Fracastoro's universe is a living animal, governed by a world soul[20] and characterized by an encompassing harmony between its several constituent parts. In this respect, Fracastoro's cosmos seems to be totally incompatible with Hobbes's reduction of all reality to matter in motion. Nevertheless, Fracastoro combines his animism with a strong naturalistic, anti-metaphysical stance, which certainly could have made him appear a congenial spirit to Hobbes.

Fracastoro claims that though metaphysics may very well deal with eternal and noble entities, the limitations of our human intellect are such, that we are hardly capable of attaining any knowledge of them. By contrast, knowledge of natural phenomena is both certain and limitless, since nature is all around us and directly accessible to our senses. Therefore, Fracastoro states that natural philosophy "is to be seen, among all other [disciplines], as the greatest and the most worthy".[21]

[17] The work allegedly reproduces Giambattista della Torre's monologue, containing no discussion whatsoever. Giambattista della Torre's speech is only interrupted by a few poems.

[18] The three dialogues first appeared in the posthumous Giunta-edition (Venice, 1555): *Naugerius*, 153-164D; *Turrius*, 165-206D; *Fracastorius* 207-224B. Connected with these three dialogues is an unfinished manuscript on theological matters, such as grace, predestination and free will. The text is to be found in *Scritti Inediti di Girolamo Fracastoro*, ed. F. Pellegrini (Verona, 1955), 139-89.

[19] This should not worry us too much, since Hobbes is usually very reticent about his sources. Any attempt to establish Hobbes's sources usually has to rely solely on an analysis of texts, without the help of external evidence.

[20] Cf. *Fracastorius* 208B: "quare & hoc universum, tanquam animal quoddam perfectissimum, vivere & anima sua regi atque agitari maiores nostri omnes fere dixere ac multa quidem de mundi anima theologizantes academici tradidere".

[21] *Turrius* 165B ("propter quae philosophia, quae de hisce est, inter alias maxima et dignissima censeri debet"). The text in question is in fact largely a paraphrase of Aristotle, *De Partibus Animalium* 644 b 24 - 645 a 25, a passage which contrasts knowledge of celestial things with knowledge of terrestrial substances. Cf. 644 b 31: "The scanty conceptions to which we can attain of celestial things give us, from their excellence, more pleasure than all

This stress on the *hic et nunc*, rather than the metaphysical realm, runs parallel to Fracastoro's distinction between universal and particular causes. Fracastoro underlines that our explanations of natural phenomena should concentrate on their direct cause (*causam particularem et propriam*), rather than their universal cause (*universalem et primam causam*), i.e. God.[22] God has endowed natural bodies with a certain nature and certain powers by which they can act on other bodies. It is these particular natures and powers we should turn to in our investigation of particular natural causes, not to God, on whom they all ultimately depend, since "God does not direct (nature) as an immediate agent (*agens immediatum*), but only as a universal and primary agent (*agens universale et primum*).[23]

Fracastoro's stress on proper causes also exhibits a certain pragmatic attitude. In his *Dies Critici* he insists that the student of medicine, instead of being dazzled by universal causes, has to deal with those causes that are "more comprehensible and relevant to the physicians".[24] Fracastoro implies that the physician should only occupy himself with the knowledge of those causes and effects which he can put to use in his daily practice.[25]

Fracastoro not only rejects universal explanations, he also discards non-natural explanatory devices. According to Fracastoro, God is the source of order in the natural world, which is characterized above all by harmony and unity, "a hidden *consensus* and *dissensus*, which is also called sympathy and antipathy".[26] In renaissance philosophy, the Stoic, Neo-Platonist and Hermetic notion of cosmic sympathy, was usually employed in the context of natural magic.[27] Though Fra-

our knowledge of the world in which we live... On the other hand, in certitude and in completeness our knowledge of terrestrial things has the advantage. Moreover, their greater nearness and affinity to us balances somewhat the loftier interest of the heavenly things that are the objects of the higher philosophy" (Aristotle is cited after *The Complete Works of Aristotle*, ed. J. Barnes (Princeton, 1991).

[22] *De Symp et Ant.* 79D. See also *De Symp et Ant.* 78B: "Causarum enim quum quaedam universalissimae sint & remotissimae a rebus, quaedam vero propinquiores et particulares magis, ac demum quaedam propinquissimae, et propriae, proprias quidem et propinquissimas in reconditis, et difficilibus attigisse aut Dei certe est, aut divini. Universalissimis vero stare ignavi et rustici ingenii est, medias vero inquirere, et ad proprias niti (quantum homini datur) philosophi certe est".

[23] *Turrius* 191B.

[24] *Dies Critici* 70D (quae magis rationabilia sunt, & ad medicos pertinentia).

[25] Cf. E. Peruzzi, "Note e ricerche sugli 'Homocentrica' di Girolamo Fracastoro," 257-8.

[26] *De Symp. et Ant.* 79A ("latens rerum consensus & dissensus, quam Sympathiam & Antipathiam dicunt").

[27] For a discussion of the philosophy of sympathy and antipathy in the renaissance, see L. Thorndike, *A History of Magic and Experimental Science,* vols. V & VI (New York, 1959), passim. See also E.U. Grosse, *Sympathie der Natur. Geschichte eines Topos* (München, 1968).

castoro admits that sympathy as such is imperceptible, he rejects any attempt to interpret it in terms of rationally inaccesible, "occult qualities". In scholastic philosophy, occult qualities were invoked in order to account for "miraculous" phenomena, such as the tides and magnetism. Occult qualities, such as "hidden" astral influence, were considered to be non-reducible to "normal" physical qualities, and therefore to fall outside the regular scope of Aristotelian physics.

By contrast, Fracastoro, possibly inspired by Pico and Pomponazzi[28], tries to explain "occult qualities" by means of rationally accessible principles. In his tract *De Causis Criticorum Dierum*,[29] he rejects the Galenic theory that each illness is characterized by a fixed number of critical days, caused by the monthly rhythm of "hidden" lunar influences.[30] Fracastoro does not deny that terrestrial bodies can be affected by influences originating from the moon and other celestial bodies. However, he explains this astrological influence in terms of light and movement, i.e. as normal physical phenomena, rather than occult qualities.[31] Moreover, on the basis of his experience as a physician he concludes that critical days do not follow a monthly rhythm, but have a different pattern in each single case. Thus, he tries to demonstrate that the existence of critical days should not be explained in an astrological fashion. Critical days are rather determined by causes within the patient, namely the (disrupted) motion of the corporeal humors, which differs according to the constitution of the patient and the nature of the disease in question.

However, this does not mean that Fracastoro categorically rejects astrology. He even tells us that he holds it in high esteem.[32] But, quite like his teacher Pomponazzi,[33] it is precisely out of deep respect for astrology that he would like to see it stripped of its occult and demonical aspects, and prefers that it be turned into a rational, practical science.[34] "All sublunary bodies are guided and in diverse ways affected by the superior bodies.[35] Therefore, the knowledge of their states

[28] E. Peruzzi, "Antioccultismo," 47.

[29] *Opera Omnia* 66-78C.

[30] For a discussion of Fracastoro's account of *dies critici* and its renaissance background, see E. Peruzzi, "Antioccultismo," 54.

[31] See also *De Contagione*, Bk I, Ch. 6, 107C: "Quod causa contagionum, quae ad distans fiunt, reducenda non sit ad proprietates occultas".

[32] *Dies Critici* 67B.

[33] P. Pomponatius, *De Naturalium Effectuum Causis sive de Incantationibus* (Opera, Basileae, 1567).

[34] Cf. Fracastoro's negative account of demonic astrology in *De Iosepho, Opera Omnia* 263ff. For a discussion, see K. Kempkens, *Joseph und Aeneas, Untersuchungen zum "Joseph" des Girolamo Fracastoro, einem Bibelepos Italiens aus dem 16. Jahrhundert* (Diss. Bonn, 1972), 86-93.

[35] Cf. Aristotle, *Meteor.* II, 339 a 22-33.

and changes is certainly very useful. It is also of the greatest benefit to prognostic possibilities [i.e. astrology] in many areas: medicine, nautics, farming and many others".[36]

Fracastoro discusses cosmic sympathy in the same naturalistic vein. Though cosmic sympathy explains the cohesion and harmony of the natural world, it is itself not a sufficient explanation for individual natural bodies actually attracting and repelling each other. It is rather an *explanandum*, which should be accounted for in naturalistic terms. In this context, Fracastoro sets out with the Aristotelian rejection of *actio in distans* : "no action is possible without contact, as is proved in *naturalibus*".[37] Fracastoro therefore claims that the actual attraction or repulsion of distant bodies that have a certain sympathy or antipathy can be explained only by assuming that they emit a *tertium quid* which brings about contact between the bodies and becomes the cause of their attraction or repulsion.[38] Here Fracastoro introduces his crucial notion of *spiritual species*, a *forma spiritualis,* which is produced by the material form of an object. Fracastoro claims that spiritual species are a film-like part or degree of material objects, which can be called spiritual on account of their fineness and and their being propagated in an instant.[39] They represent the substances which release them as well as their *modi,* including a certain sympathy and antipathy (or *consensus* and *dissensus*, the terms Fracastoro prefers to use) that these substances have with other substances and their species. Like material forms, spiritual species are substances, albeit with a different degree of existence.[40] Though Fracastoro seems to depend on the

[36] *Homoc.* 3A: "nam quoniam quae hic sunt a superioribus & reguntur, & variis afficiuntur modis, superiorem quidem status mutationesque cognovisse utilissimum certe est & in vita magnopere desyderandum. Quam ob rem & prognosticae facultati in multis, & medicinali, & nauticae arti ac rusticae, & multis aliis summopere accommoda est".

[37] *De Symp. et Ant.* 82B ("ut in naturalibus demonstratur"). I agree with G. Weidmann, *De Sympathia et Antipathia liber unus von Girolamo Fracastoro,* 216, n. 17 that this is a reference to Aristotle's "Naturalia". Weidmann does not give an exact reference, but he apparently has in mind Aristotle's *De sensu et sensibilia* 3, 440 a 16-17, part of the series of works which have been known since Averroës' time under the general title *Parva Naturalia*: "for they (the atomists) must, in any case, explain sense-perception through touch; so that it were better to say at once that visual perception is due to a process set up by the perceived object in the medium between the object and the sensory organ; due, that is, to contact, not to emanations".

[38] *De Symp. et Ant.* 82B and 83C.

[39] *De Symp. et Ant.* 83A-B.

[40] *De Symp. et Ant.* 83A: "si igitur spirituales vocatae species omnes qualitates quaedam sunt, dicere fortasse nullo pacto possumus per ipsas eiusmodi attractiones fieri: si vero alique illarum substantiae sint, nihil (ut opinor) prohibet ad eas rationem omnem tam miri effectus referri, qui inquiratur a nobis. Recipiendum autem est (ut multis placet) spirituales species eiusdem rationis esse cum formis illis, quarum sunt species, nec diferre ab iis nisi modo subsistendi".

medieval theory of *multiplicatio specierum*, advocated by Roger Bacon and Robert Grosseteste[41], his views are quite unique. Unlike Bacon and Grossesteste, he conceives of species not in terms of a qualitative alteration of the corporeal medium, but rather as substances travelling through this medium. On the other hand, in spite of the atomistic overtones of his doctrine and his frequent use of atomistic jargon,[42] he rejects atomistic explanations of magnetism, and attraction and repulsion in general.[43]

3. Hobbes and Fracastoro's Natural Philosophy

It has been maintained, that animistic, pansensist and astrologically inclined philosophies, such as the ones advocated by Campanella and Fracastoro have very little in common with the seventeeth-century mechanicist reduction of all physical reality to matter in motion.[44] Indeed, in the case of Fracastoro and Hobbes, at first sight there does not seem to be much agreement between renaissance naturalism and mechanicism. In Fracastoro there is no parallel to Hobbes's strict mechanistic explanation of all change in bodies in terms of local motion produced by other bodies[45] and the concomitant categoric denial of self-motion,[46]

[41] E. Peruzzi, "Antioccultismo," 126.

[42] See *De Symp. et Ant.* 83A.

[43] See *De Symp. et Ant.* 79C: "Antiqui quidem, ut Democritus & Epicurus, quos e nostris Lucretius secutus est, effluxiones corporum, quas Athomos appellabant, principium eius attractionis ponebant: quae quidem effluxiones ne negandae quidem sunt (ut mox ostendemus) modus autem, quem ipsi tradebant, sat rudis & ineptus erat". See also E. Peruzzi, "Antioccultismo,", 114, 122, 128. Peruzzi strongly denies any trace of atomism in Fracastoro. On the other hand, Spruit, *Species Intelligibilis*, 47 claims that although Fracastoro's doctrine of sensible species "was not new in the history of cognitive psychology, it was put forward in remarkably Epicurean words". This is not the occasion to decide this issue. I agree with Pearce ("Intellect and Organism," 264n.25) that "the whole question of Fracastoro's 'atomism' merits investigation".

[44] See e.g. R. Lenoble, *Mersenne ou la Naissance du Mécanisme* (Paris, 1943), 7: "il est clair que si, avec le Naturalisme, nous sommes bien loin de la Scolastique, nous nous trouvons aux antipodes du Mécanisme". E. Peruzzi, "Antioccultismo," 129 rejects the interpretation of Fracastoro's natural philosophy as a kind of proto-mechanicism, by stressing the fact that it constitutes a combination of Averroist-Aristotelian physics with Neoplatonist and Hermetic views.

[45] DCo IX, 9 (OL I, 111). References to Hobbes's works are given according to the Molesworth edition (London 1839; Reprint Aalen 1966), "EW" designating the English Works and "OL" the Opera Latina. Volume numbers are in Roman, page numbers in Arabic numerals. The following abbreviations are used: DCo = De Corpore (followed by the chapter in roman and the article in arabic numerals); L = Leviathan; DCi = De Cive; EL = Elements of Law. I will make use of the Jacquot / Jones-edition (*Critique du "De Mundo" de Thomas White*, ed. J. Jacquot et H. W. Jones (Paris, 1973) of the manuscript formerly known as *Anti-*

though Fracastoro shares with Hobbes the Aristotelian principle that bodies cannot act on other bodies without contact. Neither does Fracastoro follow Hobbes in his systematic reduction of final and formal causality to efficient and material causality.[47] True, his account of spiritual species highlights material and efficient factors, neglecting formal and final considerations. However, Fracastoro does not explicitly discuss the scholastic doctrine of natural causes, and what is more important, his universe is still an inherently teleological one.[48] Finally, Fracastoro retains the Aristotelian matter-form ontology, which is reinterpreted in mechanistic terms by Hobbes.[49]

Nevertheless, even though the mechanistic content of Hobbes's natural philosophy may differ substantially from Fracastoro's views, Hobbes shares Fracastoro's naturalistic, anti-metaphysical approach to philosophical problems. Like Fracastoro, Hobbes argues for a pragmatic foundation of scientific knowledge.[50] Scientific knowledge is not an end in itself, but proves its utility only if it can give rise to practical applications.[51] Philosophy is conducive to the generation of "such effects, as human life requireth".[52] This practical aim helps us accept the

White. The work will be cited under its more correct title *De Motu* (see K. Schuhmann, "Hobbes dans les Publications de Mersenne en 1644," *Bulletin Hobbes VII. Archives de Philosophie* 58 (1995), 2-7) and abbreviated as DM (followed by the page number). The *Short Tract* will be cited according to the edition by Jean Bernhardt: *Thomas Hobbes. Court Traité des Premiers Principes. Le Short Tract on First Principles de 1630-1631*, ed. J. Bernhardt (Paris, 1988). The *Short Tract* will be abbreviated as ST, followed by the number of the section (in Roman numerals) and that of the Principle (P) or Conclusion (C) (in Arabic numerals) in question.

[46] See already *Short Tract* I C. 10: "Nothing can move itself". See also DCo IX, 7 (OL I, 110) and OL IV, 226.

[47] DCo X, 7 (OL I, 117).

[48] Cf. Fracastoro's discussion of goal-directed behaviour of inanimate bodies in *De Symp. et Antip.* 79D.

[49] There are two versions of Hobbes's reinterpretation. In *De Corpore* VIII, 23 (OL I, 104) "Essence" or "form" is defined as the accident or aggregate of accidents by which we name a body, or which we find characteristic of a certain body. Alongside this extreme nominalist definition we find in *De Motu* the description of essence as the specific motion of the internal parts of a body by which it appears to us in a specific way. See e.g. DM 289: "essentia sive constitutio uniuscuiusque corporis specifica, id est ea per quam sensibus nostris dissimile apparet caeteris corporibus, in motu quodam consistit partium eius internarum".

[50] U. Weiß, "Wissenschaft als menschliches Handeln. Zu Thomas Hobbes anthropologischer Fundierung von Wissenschaft," *Zeitschrift für philosophische Forschung* 37 (1983), 37-55.

[51] OL I, 6. Cf. also EW I, 7: "The *end* or *scope* of philosophy is, that we may make use to our benefit of effects formerly seen; or that, by application of bodies to one another, we may produce the like effects of those we conceive in our mind, as far forth as matter, strength, and industry, will permit, for the commodity of human life".

[52] L XLVI (EW III, 664). See also OL II, 388.

fact that in natural philosophy we usually cannot arrive at absolute knowledge of natural causes, but have to content ourselves with hypotheses. Hobbes stresses that since most natural effects are brought about by imperceptible motions and could be produced in various ways, we can only make use of hypotheses concerning their causes. These hypotheses should be imaginable and should not contradict other hypotheses.[53] Though they do not provide us with insight of the ultimate causes of natural effects, they do serve as the basis for practical applications. This is not unlike Fracastoro's appeal that we should deal with those causes which we can put to work in our daily practice.

Like Fracastoro, Hobbes combines a strong anti-metaphysical stance with an emphasis on proper and natural, as opposed to universal and non-natural causes. In Hobbes, this naturalistic attitude manifests itself as a sharp demarcation between reason and natural philosophy on the one hand, and faith and theology or metaphysics on the other. In his *De Motu* Hobbes claims that God, as *causa prima*, does not act immediately in nature, but only mediately through *causae secundae*, i.e. through natural bodies.[54] Therefore, natural philosophy concentrates on secondary causes, rather than on God.[55] In fact, we cannot acquire any rational knowledge of God's nature. Natural philosophy deals with entities conceivable by the human mind, i.e. bodies and accidents. By contrast, God and the angels are not open to rational investigation. God is the source of all movement, but His nature remains unknown to us. All attributes (goodness, infinity, omnipotence etc.) we ascribe to Him are nothing but expressions of our will to honour Him, and do not reflect any rational knowledge of His nature.[56] This strict distinction between reason and faith is connected with a sharp rejection of scholastic metaphysics as a synthesis of Greek philosophy and Christian faith.[57] In *De motu,* Hobbes

[53] See DCo XXV, 1 (OL I, 316); EW VII, 6 and 184; OL IV, 254.

[54] DM 399: "Deus efficiat omnes actiones naturales per causas secundas, nempe corpora, ex quibus constituitur universum". In the *Leviathan* Hobbes makes a similar distinction between "remote causes" and "causes immediate" (EW III, 92).

[55] See L XLVI (EW III, 678): Hobbes defines natural philosophy as "the knowledge of the subordinate and secondary causes".

[56] Cf. DM 115, 333, 340, 396.

[57] Cf. DM 323: "..quo profecto neque Christianos esse puto, qui Deum non colunt nisi quem concipiunt, nec philosophos, qui de eo, quem non concipiunt, putant se proprietatem ullam posse demonstrare". The most extensive attack on scholastic metaphysics as nothing but "vain philosophy" and "insignificant speech" is to be found in chapters 46 and 47 of the *Leviathan*. See also EW I, x (DCo, Ep. Ded.): "There entered a thing called *school divinity,* walking on one foot firmly, which is the Holy Scripture, but halted on the other rotten foot, which the Apostle Paul called *vain,* and might have called *pernicious philosophy;* for it hath raised an infinite number of controversies in the Christian world concerning religion, and from those controversies, wars. It is like that *Empusa* in the Athenian comic poet ... having one brazen leg, but the other was the leg of an ass. ...Against this *Empusa* I think [xi] there

stresses time and again that we cannot rationally decide on common scholastic metaphysical questions, such as the possibility of God creating other worlds, or whether God must be thought able to make the world infinitely great etc. All such questions have nothing to do with science, but are solely matters of religious dogma, and it is therefore up to the ecclessiastical authorities, appointed by the Sovereign, to decide what we should believe concerning these matters.[58]

An interesting application of Fracastoro's distinction between *causa prima* and *causae propriae* can be found in his account of the possible existence of a natural vacuum. Fracastoro subscribes to the Scholastic tenet that nature does nothing in vain and therefore does not permit the existence of a vacuum, since in a void no natural agent can work.[59] However, he does not agree with the scholastic explanation of what causes the prevention of a vacuum. The scholastics made a distinction between the *natura particularis* of natural bodies and the *natura universalis* or Nature as a whole. In some cases, such as the famous clepsydra experiment[60], universal nature has to overrule the particular natural tendencies of certain bodies (in the case of the clepsydra that of the water which would normally stream out of the lower pores of the clepsydra). Fracastoro rejects the assumption that immaterial Agents such as God, universal Nature or some higher Intelligence directly prevent the occurence of a vacuum. Instead, he offers an explanation on the basis of the particular natures of bodies themselves.[61] All bodies seek their self-preservation, which is best assured when a body is contiguous with other bodies. As a consequence, bodies constantly strive to keep in contact with other bodies and therefore do not permit a gap in the material continuum of nature.[62] Since God

cannot be invented a better exorcism, than to distinguish between the rules of religion, that is, the rules of honouring God, which we have from the laws, and the rules of philosophy, that is, the opinions of private men; and to yield what is due to religion to the Holy Scripture, and what is due to philosophy to natural reason."

[58] See e.g. DM 373: the disputation on the question for what purpose God created the world "non pertinet ad philosophiam neque ad naturalem aliquam theologiam, sed ad religionem, de qua non rationibus humanis, sed ex Scriptura Sacra ex decretis Ecclesiae disputandum erat". See also DCi XVII, 28 (EW II, 412).

[59] *De Symp. et Ant.* 79C.

[60] A jar with small holes underneath and a bigger orifice on top. If the jar is filled with water and its upper orifice is blocked, the water does not stream out of its bottom holes. For a discussion, see Ch. B. Schmitt, "Experimental Evidence For and Against a Void: the Sixteenth-Century Arguments," *Isis* 58 (1967), 352-363 and E. Grant, *Much Ado About Nothing. Theories of Space and Vacuum from the Middle Ages to the Scientific Revolution* (Cambridge, MA, 1981), 67ff.

[61] *De Symp. et Ant.* 79D-80A.

[62] A similar explanation is later offered by Telesio (B. Telesio, *De Rerum Natura Iuxta Propria Principia,* ed. L. de Franco, vol I (Cosenza-Firenze, 1965), 192.

endowed bodies with this tendency, He may ultimately be held responsible for the prevention of a vacuum. However, Fracastoro repeats his methodological *maxime* that it is not God or the *causa prima* that the natural philosopher should be interested in, but that he only has to take into account the particular natures and tendencies of bodies, in this case their natural drive for self-preservation.

Hobbes' rejection of universal nature as an explanatory principle is even more radical than Fracastoro's: in *De Motu* he flatly denies its existence.[63] Or, as he puts it elsewhere: "there is nothing that truly exists in the world but single individual bodies producing single and individual acts or effects".[64] The notion of self-preservation is of course one of the cornerstones of Hobbes' anthropology.[65] There are also some traces of a doctrine of self-preservation in Hobbes' natural philosophy, notably in *De Motu.* In a very interesting passage, Hobbes entertains a rather animistic explanation of the diurnal motion of the earth. He explicitly compares the earth to an animal that approaches a fire in order to warm itself, but withdraws from it when it gets too hot. In the same vein, the parts of the earth that enjoy the light and warmth of the sun, turn away from it when saturated.[66]

We have already seen that Hobbes's anti-metaphysical stance and stress on proper causes is rather similar to naturalist theories, such as the one maintained by Fracastoro. Now, the above passsage reveals that at least in an early stage of his philosophical career, Hobbes adopts theories which come very close to the kind of animism professed by philosophers such as Fracastoro and Campanella.

Hobbes's relative proximity to renaissance naturalism is also demonstrated by his tendency to explain astrological phenomena in rationally accesible terms, i.e. in terms of matter and motion. This is comparable to Fracastoro's attempt to turn astrology into a serious, rational science. Though as yet Hobbes' attitude towards astrology has not been systematically investigated, and for that matter is not entirely consistent either, we can draw some tentative parallels between his and Fracastoro's account of "prognostics".

In the *Short Tract* Hobbes claims to be able to give a rational explanation of "the Experience of Magneticall virtue, and of Influence from the Moone on humide bodyes[67], and generally from the starres on Sublunary things".[68] In line with

[63] DM 141: "nullius igitur rei natura universalis est; non magis ergo datur natura universalis, quam res universalis, id est non datur omnino".
[64] In the so-called NLW-manuscript, published by Jacquot and Jones in their edition of *De Motu* (DM 449).
[65] Cf. L. Strauss, *Natural Right and History* (Chicago and London, 1970), 181.
[66] DM 246.
[67] This may refer either to the phenomenon of the tides or to the influence of the moon on the corporeal *humores*, which is generally accepted in renaissance medicine (and also discussed by Fracastoro in his *Dies Critici*).
[68] ST II.C.2.

this, in *De Motu* Hobbes accepts that the stars have a certain *influentia*[69] on terrestrial bodies, but claims, however, that this influence has to be explained rationally, i.e. in terms of matter and local motion. According to him, the stars exert an imperceptible pressure on the medium (ether or air) which is transmitted to the earth. By means of this motion the stars can warm the earth and cool it down, illuminate it, make it dry or humid etc. "It is this motion of the stars which is commonly called *influentia*".[70]

Hobbes's self-styled notion of astral influence does not necessarily imply that he is also prepared to accept astrology as a serious science. He says that the influences play a certain role in all cause-effect relations on earth, and even goes so far as to defend the Pomponazzian-like *dictum* that the "sum of all causes which are in the stars, is the sum of all causes which are in the universe".[71] However, since the astral influences are not only imperceptible but also, much more importantly, infinite in number, we can learn nothing conclusive about them. This implies that, although we may state in general that all future effects will depend on the astral influences, we cannot specifically predict which effects these causes will have. Therefore, unlike Fracastoro, Hobbes rejects the claim of astrology that it might make reliable predictions concerning our terrestrial affairs. The only safe prognoses are the astronomical ones which concern the movements of the stars and planets themselves, not their pressure on the medium, i.e. their influence, as it is studied by astrology.

Similarly, Hobbes excludes astrology from the ranks of the sciences in *De Corpore*[72] and repeatedly scorns the pretentions of the astrologers.[73] On the other hand, he does not seem to have entirely given up hope on being able to turn astrology into a real science, given the fact that he lists the following items in his catalogue of sciences in the ninth chapter of the *Leviathan*: "SCIOGRAPHY. Consequences from the influence of the stars" and "ASTROLOGY. Consequences of the qualities from liquid bodies, that fill the space between the stars; such as are

[69] Fracastoro does not use this common astrological term, but instead speaks about *qualitates occultae.* However, these two terms are conceptually very close, as may be clear from the following passage of Hobbes' *De Motu* 397, where he states that people do not perceive the actions of the stars, but nevertheless give them all kind of names: "sympathiam aut antipathiam aut occultam qualitatem aut denique influentiam, sed nunquam motum; quasi qualitates naturae et potentiae corporum eodem modo infunderentur in corpora, quo aqua aut alia res fluida infunditur vel influit in vasculum".

[70] DM 397: "atque talis motus est, quem in astris vulgo vocant *influentiam*".

[71] DM 397: "sequitur collectionem omnium causarum, quae sunt in astris, esse collectionem omnium causarum, quae sunt in universo".

[72] OL I, 10. Note, however, that he explictly confines his criticism to astrology "as it nowadays exists".

[73] Cf. EW VI, 282.

the air, or substances ethereal".[74] Unfortunately, the exact purport of these remarks is not clear, since Hobbes does not dwell on either of those sciences.

We can, however, safely conclude that Hobbes shows a sustained critical interest in astrology, which dates back to the earliest days of his philosophical career[75], as is shown by the evidence of the *Short Tract.* Hobbes seems to have had more than the more or less superficial, erudite interest in astrology that some of his contemporary *virtuosi* had. Like Fracastoro, Hobbes rejects any explanation by means of "occult qualities"[76] and at least in the early stages of his philosophical career tries to give a rational, scientific account of astrological phenomena.

4. Fracastoro's Epistemology

According to Fracastoro, spiritual species are involved in any action at a distance, including human perception, cognition and volition. Thus, Fracastoro's doctrine of species has strong naturalistic consequences, stressing that man forms an indissoluble part of the natural world. Human psychology involves the same fundamental laws of sympathy and antipathy which govern nature as a whole. Fra-

[74] EW III, 73.

[75] The Chatsworth manuscript E 2, a catalogue of books, baptized "una biblioteca ideale" and dated around 1630 by its modern editor, contains 123 references to astrological books (cf. A. Pacchi, "Una *Biblioteca Ideale* di Thomas Hobbes: Il MS E2 dell' Archivio di Chatsworth," *Acme* 21 (1968), 3-40). According to Pacchi (*Una Biblioteca Ideale*, 11) this reflects Hobbes's "particularly vivid interest [in astrology]". However, the handwriting of the manuscript has recently been identified as Robert Payne's rather than Hobbes's own (*Thomas Hobbes. The Correspondence*, ed. N. Malcolm, vol. II (Oxford, 1994), 874). In general, Hobbes's involvement with this manuscript is still far from clear. Thus, we have to be careful to adduce it as evidence for Hobbes's interest in astrology, though in any case it does seem to reflect a preoccupation with astrology within Hobbes's intellectual *milieu*.

[76] Again, what distinguishes Hobbes from Fracastoro is his systematic rejection of any explanation of natural phenomena in non-mechanistic terms, including the ones invoking sympathy and antipathy. Cf. L XLVI (EW III, 679-80): "and in many occasions they [i.e. the scholastics] put for cause of natural events, their own ignorance; but disguised in other words: as when they say, fortune is the cause of things contingent; that is, of things whereof they know no cause: and as when they attribute many effects to occult qualities; that is, qualities not known to them; and therefore also (as they think) to no man else. And to sympathy, antipathy, antiperistasis, specifical qualities, and other like terms, which signify neither the agent that produceth them, nor the operation by which they are produced". See also EW VII, 72, 155; DCo XXX, 15 (OL I, 431). However, in the *Short Tract* Hobbes still used a concept of sympathy and antipathy. More on this in the fith section of this paper.

castoro elaborates the role of species in human intellection[77] in his *Turrius*, where he announces that he will concentrate solely on the mental operations of the human soul, leaving aside the discussion of its ontological status. Again, this is a remarkable naturalistic trait, since in this epoch any account of intellection was bound to involve the discussion of the status of the intellective soul and its immortality which had been triggered by Pomponazzi's *De Immortalitate Animae* (1516).[78]

Fracastoro begins his account by stating that all intellection must be conceived of as a change (*mutationem*) from not-knowing to knowing. This change can be brought about neither by the soul itself, nor by the external object, since the latter does not touch the soul.[79] Therefore the object must send out representative species or *simulachra* which are received by the soul.[80] In this process the species play an active role, whereas the soul remains purely passive. "In the act of knowing, the soul only undergoes (the action of the species), and does not do anything...since the representation of the object occurs immediately once the soul receives the species".[81]

[77] Intellection is defined by Fracastoro as "cognitionem omnem, quae post sensus ab anima introrsum fit" (*Turrius* 165D).

[78] On this debate, see E. Kessler, "The Intellective Soul," in: *The Cambridge History of Renaissance Philosophy*, ed. Ch. B. Schmitt, Q. Skinner and E. Kessler (Cambridge 1992), 485-534 and G. Di Napoli, *L'Immortalità dell'Anima nel Rinascimento* (Torino, 1963). Fracastoro deals with the question of the soul's immortality in his *Fracastorius, sive de Anima* which partly contradicts the account of intellection given in the *Turrius*. As S. Peirce, "Nature and Supernature in the Dialogues of Girolamo Fracastoro," *The Sixteenth Century Journal* 27 (1996), 120-1 has it: "The account of human mental capacities he develops in the *Turrius* demonstrates that discursive thought, as an activity unique and proper to human beings, is an entirely natural phenomenon, in the sense that it is an operation in and of the material world". However, in the *Fracastorius* he "maintains that the soul has a *propria operatio*, a function peculiarly its own, and so the inference as to its separability may be drawn. The function he has in mind, however, is entirely removed from the natural realm and belongs exclusively to the order of grace. This function, whose goal is nothing other than the beatific vision, accessible only with God's gratuitous help, Fracastoro calls *the life of the spirit*". This dual perspective on the human soul might be seen as foreshadowing Telesio's distinction between corporeal *spiritus* perishing with the human body and immaterial, immortal *anima*. Telesio's relation to Fracastoro has nt been adequately investigated yet, but there are some interesting observations in G. Martano, "La Svolta Telesiana nella Storia dei Concetti di Spazio e Tempo," in *Bernardino Telesio nel 4o Centenario della Morte (1588)* (Napoli, 1989), 71-101.

[79] *Turrius* 166A: "non attingit animam". The hidden premise is of course the Aristotelian *dictum* that no action is possible without contact.

[80] *Turrius* 166A: "necesse est igitur demitti aliquid ab obiecto, quod proxime attingat animam, atque illam mutet".

[81] *Turrius* 166C-D: "mihi autem videtur, nisi fallor, tantum pati anima intelligendo, et nihil praeterea agere statim enim ubi recepit speciem, repraesentatio illa fit obiecti".

Intellection comprises several stages, the most important of which are *sensus communis*, *subnotio* and knowledge of universals. Fracastoro makes it clear that he interprets the concept of *sensus communis* in the traditional scholastic sense as the perceptual faculty which is able to consider the different *sensibilia* grasped by the different senses *qua* being different.[82] In other words, *sensus communis* can compare several pieces of sensory information. Much more original is Fracastoro's concept of *subnotio*,[83] defined by him as "the second act of intellection, which comes after *sensus communis* and before all other intellections. I call *subnotio* that cognitive activity in which the soul is moved, as it were, to inspect one by one the many different elements presented simultaneously and in confused order in any single apprehension".[84] In this context, Fracastoro uses the example of a forest,[85] which in the act of sense is first grasped as one confused and indistinct whole. Subsequently, we begin to perceive different trees, different leaves etc. This process of inner differentiation and clarification is what Fracastoro calls *subnotio,* "nothing but the representation of one *sensibile* after another",[86] which occurs instantanuously during an act of sensation as well after that. *Subnotio* itself is a simple act of apprehension which neither asserts truth nor falsity.[87] It serves as the basis for judgements by means of composition and division, which involve truth claims.[88] In turn, it is by composition and division that we are finally able to form universal concepts.[89] For instance, we grasp the universal concept "white", first by isolating the color white in milk by *subnotio*, and by subsequently comparing it to the color white as seen in snow and other white objects. This cannot be done immediately after birth, but only later in life, after having received a sufficient amount of species, having formed a sufficient amount of *subnotiones* and having established enough compositions and divisions.

Consequently, Fracastoro abolishes the traditional scholastic distinction between sensible and intelligible species. According to Fracastoro, species have a

[82] *Turrius* 168A.

[83] Fracastoro himself claims to be original, though he admits that Aristotle's concept of *phantasia* comprises an activity which Fracastoro would call *subnotio*. Cf. *Turrius*169D.

[84] *Turrius* 169C-D; transl. S. Pearce, "Intellect and Organism," 244 ("...eam cognitionem, qua sub uno quodam apprehenso multa alia simul confuso quodam ordine sese offerunt: ad quem consequenter movetur anima, unum post aliud ceu inspectura").

[85] *Turrius* 170A.

[86] *Turrius* 169D ("simplex, & sola repraesentatio unius sensibilis post aliud").

[87] *Turrius* 169D.

[88] *Turrius*170Dff. Here, Fracastoro uses standard scholastic logical terminology. Composition is the process of assembling the similar in an act of affirmation, while division divides the dissimilar in an act of negation.

[89] *Turrius* 176D.

two-fold ontological status.[90] On the one hand, when considered in their own right (*secundum se*), they are to be called objects which have an independent and absolute being. On the other hand, we can focus on their representative character, i.e. on their relative being.[91] As things in their own right, species are called *qualitas*[92] and *ens per se*, which is the traditional scholastic ontological label for substances. Thus, by calling the species a quality on the one hand, and on the other hand assigning substance-like being to them, Fracastoro seems to take up his characterization of species in *De Sympathia* as substances of a lesser degree than the original material substances they represent. Considered under their representative aspect, species may be called the image (*imago*) of the object.[93] The species not only represent the object itself, but also its various *modi*, such as its shape, site, magnitude, its being in rest or motion etc.[94] Fracastoro summarizes this dual status of the species by stating that the species are both one (considered in themselves) and not one (considered as representation or *imago*).[95]

Fracastoro uses this distinction in order to argue for the identity of species in sensation and intellection. He concludes that the species in sense and intellect are one and the same; at least as far as they are considered in their being a *qualitas*.[96] Considered as representations and images of the external objects, however, there are important differences (e.g. in clarity) between the species present in sense and the species present to the intellect.

> "One and the same species serves both sense and intellect, but does so under different conditions. In sense experience it is confused and associated with a range of accidental concomitants; in intellection it is isolated and distinct, and is thus made

[90] Cf. L. Spruit, *Species Intelligibilis*, 48.

[91] *Turrius* 174B: "duo enim in specie repetita sunt: alterum, quod ipsa secundum se qualitas quaedam est, secundum quam ens per se est & absolutum: alterum vero est esse, quod habet, quatenus repraesentativa est: secundum quod relativum quoddam est".

[92] L. Spruit, *Species Intelligibilis*, 49 claims that "the characterization of the species as "qualitas" was frequently used by the post-Jandun generation; during the Renaissance it would also be formulated by Simone Porzio and others".

[93] *Turrius* 168C.

[94] *De Symp et Ant.* 90C.

[95] *Turrius* 168C: "species quatenus imago est, non est una, sicut neque una res, quae offertur: una tamen est secundum se, & secundum esse, quod habet ut qualitas, cui accidit habere modos plures".

[96] *Turrius* 177C: "Iam enim manifestum est unam esse & eandem speciem in utroque, sed modis diversis. In sensu enim est confusa et coniuncta cum aliis coniunctis, in intellectu vero separata et distincta, ac sic universalis facta. Dico autem esse factam universalem non secundum esse, quod habet, quatenus una quaedam qualitas est, sic enim singularis est. Sed universalem, quatenus imago est, et repraesentat".

universal. This involves no change to the species itself, which remains what it was, a quality of some particular object: it becomes universal only in its character as a representative image".[97]

Concomitant to this identification of sensible and intelligible species, Fracastoro abolishes the distinction between the agent and passive intellect. In intellection, the soul is purely passive, receiving one and the same species, though in different degrees of clarity, according to the different stages of intellection. Fracastoro explicitly attacks the orthodox Thomistic doctrine, according to which the active intellect "illuminates" (*irradiat*) the sensible *phantasmata* in the passive intellect, thus producing the intelligible species, i.e. the universal nature of the object represented without its individuating properties.[98] He also rejects the Averroistic doctrine of one, separate, immaterial agent intellect to which each individual soul is connected during the generation of the abstract universal out of sense experience. Fracastoro claims that this is a superfluous concept, since we are perfectly able to form universals on our own, by means of our innate faculties.[99]

Thus, Fracastoro stresses the empirical origin of universal concepts. Moreover, he underlines the continuity of the process leading from sensation up to the formation of universal concepts. However, in spite of the continuous character of this process, Fracastoro still needs a mediating entity between sense perception and knowledge of universals. Fracastoro constructs the opposition between sense perception and intellectual knowledge in Aristotelian fashion[100]: sense perception apprehends the *sensibile* as a confused whole, whereas knowledge of universals takes up elements of that confused whole in a clear and distinct way. *Subnotio* mediates between these two forms of cognition: on the one hand it differs from sensation in the sense that it singles out in a clear and distinct way elements from the confused sensory whole, on the other it diverges from intellectual knowledge in the sense that it does not (yet) provide knowledge of universals.

Since *subnotio* concentrates on particular sensory data, it is the first instance of mental focus and application. According to Fracastoro, the reception of species alone does not constitute cognition; some application and attention or focus (*applicatio et intentio*) of the soul is required as well.[101] If we do not pay attention to an object before our eyes, we will not perceive the object at all. Fracastoro emphasizes that mental attention should not be interpreted as an unsollicited, spon-

[97] S. Pearce, "Intellect and Organism," 250.
[98] *Turrius* 176B.
[99] *Turrius* 176A-B.
[100] *Physics* I, 1, 184 a 21 - 184 b 13.
[101] *Turrius* 170B.

taneous activity of the soul. Like all operations of the mind, attention is conceived as a physiological and kinematic phenomenon. The *instrumenta* of the soul, i.e. the animal spirits and the nerves, are moved in such a way that they can successfully receive the species of a particular object.[102] Fracastoro explains the fact that we focus on one *sensibile* rather than another in terms of the relative strength or actuality of the object, rather than in terms of a spontaneous mental activity.[103] Thus, in the *Turrius* he maintains the fundamental passivity of the soul and its inclusion in the world of natural objects.

5. Hobbes' Short Tract and Fracastoro's Epistemology

As has already been stated, Fracastoro's psychology has a strong naturalistic character in that it employs the same principles as his natural philosophy. A similar naturalistic subordination of psychology to natural philosophy is to be found in the *Short Tract.* Its third Section, dealing with sense, understanding and desire uses the principles and conclusions of the first Section, which, with some reservation may be said to develop a *Prima Philosophia* in the sense of the later Hobbes, i.e. an account of body,[104] and interaction between bodies in general.

[102] *Turrius* 170B. Pearce, "Intellect and Organism," 245 in my view overlooks this kinematic interpretation of mental attention by speaking of *subnotio* as "a fundamental activity of the soul" and "a spontaneous process".

[103] *Turrius* 170B-C. Scholastic psychology generally employed the notion of vital animal and natural spirits, which were seen as fine bodies, having an intermediate status between bodies and incorporeal souls and serving as *instrumentum* for the soul in cognition and locomotion. On spirits in scholastic and early modern philosophy, see *Spiritus. IVe Colloquio Internazionale*, ed. M. Fattori and M. Bianchi (Roma: Lessico Intellettuale Europeo, 1984).

[104] The term "body" does not occur in the first section. Instead, Hobbes uses the traditional terms substance and accident. Although Hobbes never equates the two, Bernhardt at least claims that in Sections 2 and 3 the term body would replace the notion of substance (Bernhardt, *Court Traité des Premiers Principes*, 102). This does not seem to be entirely correct. In the second Section the notion of body is only used within the specific framework of a theory of light (II.C.4 (species issued from bodies), II.C.7 (species of diverse bodies), II.C.8 (bodies send out species), II.C.9 (species issuing from bodies). In the third section the term "body" is only used with respect to the human body. Moreover in III.C.2 Hobbes makes a distinction between substance and accident, instead of between body and accident. However, already in I.C.1 Hobbes says that "every thing that *hath a being in Nature* , ..is eyther substance or accident". So the contours of the later reduction of *prima philosophia* to an account of the basic principles of *natural* philosophy are already apparent. In any case, the first section develops some form of kinetic mechanicism, which in the third section finds a special application to sense and cognition (Bernhardt, 96ff). In this sense the *Short Tract* may certainly be called naturalistic.

As we have seen, another naturalistic trait of Fracastoro's *Turrius* is his focus on the operations of the soul insofar it is united with the body, rather than on its ontological status. Hobbes shows that the soul does not have "active power inherent in itself,"[105] which amounts to denying that the soul is a *per se movens*, as the scholastics would have it.[106] He also completely discards it as an acceptable explanatory device. Its activity can be reduced to either the action of the brain or that of the species on the animal spirits both of which can be described in mechanistic terms.[107] In his account of cognition and volition, he concentrates on the animal spirits - defined as "those Spirits which are the Instruments of Sense and Motion"[108]- rather than on the soul. Though Fracastoro certainly deals with the animal spirits too,[109] he still speaks of operations of the soul, rather than of the animal spirits.

A more specific parallel between Fracastoro's and Hobbes's naturalism is the fact that they both treat perception and cognition as a special case of action at a distance, to be explained by means of species. Both authors stress that since cognition involves a change in the soul and all change can only come about by means of contact or touch, the soul has to be changed by, as Hobbes has it, "somwhat issueing"[110] from the object, i.e. species.[111] Moreover, both philosophers introduce

[105] III C.2.

[106] Fracastoro still uses the traditional scholastic definition of the soul as "forma substantialis, et principium intrinsecum *per se movens*" (*Turrius* 189A). On the other hand, he constantly stresses the passivity of the soul. Cf. for example *Turrius* 189B: "Anima modo condensat, modo rarefacit, et habet motum partium in toto, sed non semper ad unum habet, sed ad diversa, prout diversa specie est informata".

[107] III C.2. With this claim, Hobbes comes close to identifying soul with spirit, as Telesio and Campanella did. See my "Motion, Monks and Golden Mountains. Campanella and Hobbes on Perception and Cognition," *Bruniana e Campanelliana* (forthcoming).

[108] III P.1. According to Fracastoro, the "instrumenta animae" are the "spiritus ipsos, et nervos ac membranas" (*Turrius* 70C). The notion of animal spirits as *instrumenta animae* is traditionally scholastic. It is remarkable that Hobbes does not say that the animal spirits are the instruments of the soul, but the instruments of sense and motion. Perhaps we should read the 'of' as a - perhaps translated - *genitivus objectivus* and interpret Hobbes's definition in the sense that the spirits are the instruments *involved* in sense and motion and that they are the instruments of the body rather than of the soul.

[109] See *Turrius* 70C.

[110] II P.1 Cf. *Turrius* 166A: "necesse igitur est **demitti aliquid ab obiecto,** quod proxime attingat animam atque illam mutet: tale autem non aliud esse potest, quam simulachrum & species rerum, quae extra sunt".

[111] II C.2: "The Animal Sprits are moved by the Species of Externall obiects, immediately, or mediately. Seing the Animal Spirits are moved locally, by another ... and nothing can move them, unless it touch them ... and that which moveth them must be a Substance...". Cf. *Turrius* 166A. Note, however, that the third Section does not employ any of the Principles and Conclusions of the Second Section, which deals with action at a distance in general and

the notion of species in the same way, by stressing that they use familiar (scholastic) terminology, while at the same time giving their own content to it.[112]

Like Fracastoro, Hobbes attributes sympathy and antipathy to the species and moreover uses these notions to explain magnetism.[113] Furthermore, in general magnetism plays an important role in the *Short Tract*. Hobbes not only extensively discusses the behaviour of magnetic bodies in the second Section, but magnetism comes to the fore in the third Section as well. Here, Hobbes draws an analogy between magnets and one of the two faculties of the soul, viz. understanding. Understanding is defined as having a phantasm which is brought about by the action of the brain on the animal spirits. The brain receives the power to act on the animal spirits from the species emitted by the external object. Hobbes concludes his account of the generation of the phantasm as follows: "Though it may be doubted how the brayne can receive such power from the externall obiect; yet it is no more, nor otherwise, then when steele, touchd by the loadstone, receiveth from it a Magneticall virtue, to worke the same effects the loadstone it Self doeth".[114]

Moreover, Hobbes's discussion of appetite and aversion has some "magnetic" overtones as well. Hobbes states that "Good is, to every thing, that which hath active power to attract it locally", whereas *Malum* "to every thing is that, which hath active power to repell it"[115] In this connection, he uses exactly the same terminology as in his discussion of magnetism in the second Section: "There is betweene Species Conveniency and disconveniency, by which the Agents whence they issue, *attract and repell* one the other".[116] Thus, just as Fracastoro discusses

optics in particular. (See K. Schuhmann, "Short Tract," Appendix, 35-6). Hobbes only implicitly classifies cognition under the heading of action at a distance.

[112] Cf. *Turrius*, 166A: "in primis autem constare inter nos debet cognitionem omnem per rerum simulachra fieri, quae aliqui spectra vocavere: nos in scholis nostris species rerum appellamus, quo vocabulo tanquam magis familiari & nos deinceps utemur". See ST II P.1: "Every Agent, that worketh on a distant Patient, toucheth it, eyther by the Medium, or by somwhat issueing from it self. **which thing so issueing lett be calld Species**".

[113] II C.9: "There is betweene Species Conveniency and disconveniency, by which the Agents whence they issue attract and repell one the other. ...somewhat proper to their Species, which is that we call Conveniency, or Disconveniency, and the Greekes Sympathy and Antipathy". In the same conclusion, Hobbes deals with another ubiquitous example of sympathy and antipathy, viz. "how one string of an Instrument being moved, and the species of that string moved with it, working with the Species of another stringe (that is eyther an unison or an eyghth with it) by conveniency moveth the Species of that other string, and consequently the string it self, whence they come".

[114] III C.4.

[115] III C.7.

[116] II C.9.

cognition and volition in terms of sympathy and antipathy, Hobbes's account of human psychology is formulated in terms of magnetism, the paradigmatic example of phenomena involving sympathy and antipathy.

The most striking parallel between Hobbes and Fracastoro is the fact that they assign the same ontological status to the species. In the final conclusion of the second Section Hobbes claims that "Species are Substance".[117] The reason for not putting "substance" in the plural seems to be that species do indeed have a substantial status, but that, nevertheless, they are dependent on and therefore ontologically subordinate to the bodies that produce them. In the Corollary to II C.10 Hobbes explains this by means of the notions of "primitive" and "derivative" light,[118] i.e. light insofar as it is in the lucid body and light insofar as it is emitted by that lucid body. He states that whereas primitive light is an accident of the lucid body, derivative light inheres in the species. Then he goes on to say that "as the Species are to the Lucide or colourd body: so is derivative Light and colour to primitive".[119] Thus, like Fracastoro, Hobbes clearly stresses the ontological subordination of species to the bodies that produce them, while retaining their substantial character.[120]

In the *Short Tract*, Hobbes tries to develop a radical kinematic explanation of action at a distance in general and optics and cognition in particular. In this context, Hobbes discards scholastic mediumnism which explains light and vision in terms of the qualitative alteration of the medium. He does so in the second Section, which starts with a *quaestio* : "Every Agent, that worketh on a distant Patient, toucheth it, eyther by the Medium, or by somwhat issueing from it self. which thing so issueing lett be calld Species".[121] Since Hobbes excludes alteration without further ado, he can only accept an account of mediumnism in terms of the parts of the medium moving contiguous parts of the same medium by local motion; in his own words: "by successive Action[122] on the parts of the corporeall Medium". However, Hobbes propounds a serious counter-argument against this

[117] II C.10. Bernhardt erroneously reads the passage in the manuscript as: "Species are Substances".

[118] For the historical background of these notions, see D. Lindberg, *Theories of Vision from Al-Kindi to Kepler* (Chicago and London, 1976), 124 and 134.

[119] II C.10.

[120] The possibility of Fracastoro's influence on Hobbes, especially as regards the substantial status of the species was already noted by L. Spruit, *Species Intelligibilis*, 392n.176.

[121] II P.1.

[122] The notion of successive action as well a few other elements of the second Section, could point to an influence by Roger Bacon and Robert Grosseteste. See A. Gargani, "Le *Short Tract on First Principles* e la metafisica della luce di R. Grossatesta," in (Id.), *Hobbes e la Scienza* (Torino, 1971), 97-123.

theory based on the notion of "counter-agents", such as the wind, which could disrupt the motion of the medium, whereas in reality even the strongest wind does not block our vision.[123] In this context, Fracastoro's species offer a perfect alternative.[124] First, because they are not something inhering in the medium, but rather something emanating from the object and travelling through the medium. Second, because they have a substantial character, as opposed to the traditional species which are qualities inhering in the medium. Hobbes cannot accept qualities emanating from the object and reaching our senses, since "no accident can be Locally moved out of his Subiect".[125]

Hobbes's species do not only have a dual ontological status analogous to the Fracastorian ones, they also have a similar function in Hobbes's account of cognition. Hobbes makes a distinction between two cognitive faculties, sense and understanding.[126] In both cognitive processes, the soul is passive, whereas the species play an active part.[127] Likewise, Hobbes also abolishes the distinction between sensible and intelligible species. In both sense and understanding, one and the same species serves as mediator between the object and the soul. Finally, though cognition involves the total passivity of the soul, Hobbes follows Fracastoro's stress on the importance of attention. "Though the species be present in the very organ of sense, (as the species of a friend in the eye) yet if the minde be otherwise bent, there shall not be actuall sense of that friend, as is prooved by Experience".[128]

Nevertheless, despite all these strong parallels suggesting a direct influence by Fracastoro on Hobbes, it is clear that there are some differences too. Hobbes takes up Fracastoro's account of species and their role in cognition in a radically kinematic, mechanistic way. As is well known, in his later works Hobbes speaks of a

[123] In fact, II C.2 presents two arguments against mediumnism, the one based on the action on the medium flowing from an external impulse which is dealt with here, the other based on the action emananting from a source having inherent active power, which is not relevant to our purpose here.

[124] Hobbes does not make clear why species would not succumb to the counter-agent argument. Perhaps he assumes that because of their smallness their motion would not be disrupted by the wind. This point was already put forward by Brandt, *Thomas Hobbes' Mechanical Conception of Nature*, 18.

[125] I C.4. The rejection of transference of accidents is traditionally scholastic. See e.g. R. Goclenius, *Isagoge in Peripateticorum et Scholasticorum Primam Philosophiam*, Francofurti 1598 (reprint Hildesheim, 1976), 72: "Non potest accidens materiale migrare de subiecto in subiectum".

[126] III C.10.

[127] See e.g. III C.5: "The Species are Confessd to be Agents in the act of sense; and the Animal Spirits the patient".

[128] III C.5.

"rebound" of the motion coming from the object from the heart back to the senses.[129] By means of this rebound, Hobbes explains how we perceive sensible qualities outside of us, whereas in reality sensation is nothing but a motion in our animal spirits.[130] Though the *Short Tract* does not offer this full-blown theory of the subjectivity of sensible qualities, we already find a marked tendency to reduce sensible qualities to nothing but motion. Concomitant to this, the function of the species is no longer to represent sensible qualities of the objects, though Hobbes also occasionally speaks of representation.[131] Their main function is to convey the object's specific motion.[132] Likewise, Hobbes does not define sense as the reception of sensible species, but as a "power of the Animal spirits, to be moved by the Species of an externall obiect".[133]

Hobbes also defines understanding as nothing but a passive power to be moved by the species emanating from the object. However, whereas in sense the animal spirits are moved immediately by the species, in understanding this comes about by mediation of the brain: "The Act of Understanding is a Motion of the Animal spirits, by the Action of the brayne, qualifyed with the active power of the externall obiect".[134] Thus, on the one hand, like Fracastoro, Hobbes only allows for one kind of species. However, on the other he diverges from Fracastoro by defining understanding in terms of a power to be moved rather than the reception of the representative species in a clear and distinct fashion.

Thus, Hobbes gives a radical mechanistic twist to kinematic tendencies which are already apparent in Fracastoro's psychology. Hobbes takes up Fracastoro's ontological determination of the species, but adds that species "are moved lo-

[129] EL I, II, 8 (EW IV, 7).
[130] DCo XXV, 2 (OL I, 318-9).
[131] II.C.6. To be precise, it is the "beame" that is said to represent the particles in a heap of sand. On the basis of the Corollary of II.C.9 we may conclude that a "beame" is a continuous ray consisting of species that are sent out continually. This is not an uncommon supposition in traditional medieval optics. Cf. D. Lindberg, *Theories of Vision from Al-Kindi to Kepler* (Chicago and London, 1976), 24 and 221n.96, and J. Prins, "Kepler, Hobbes and Medieval Optics," *Philosophia Naturalis* 24 (1987), 297.
[132] See III C.3: "Light, Colour, Heate, and other proper obiects of Sense, when they are perceiv'd by Sense, are Nothing but the severall Actions of Externall things upon the Animal spirits, by Severall Organs. ...For if light and heate were qualityes actually inherent in the species, and **not severall manners of action**, seing the Species enter, by all the organs, to the Spirits, heat should be seene, and Light felt. contrary to Experience". Interestingly, in the first Section, Hobbes still seems to subscribe to the thesis that coulour as such actually inheres in the object. See I P. 16: "Accident is that which hath being in another, so as, without that other it could not be. as Colour cannot be, but in somewhat coloured". The third Section might reflect a later development of Hobbes's thought.
[133] III C.5.
[134] III C.6.

cally".[135] Likewise he consequently interprets sense and understanding in terms of local motion, whereas Fracastoro only stresses the soul's passivity. To be sure, Fracastoro does speak about motion and mutation in the context of human psychology. However, he does not show any interest in the question whether this should be conceived in terms of local motion or not. As already noted, just like Hobbes, Fracastoro breaks with mainstream scholasticism by stating that species are substances travelling through the medium instead of accidents qualitatively altering it. Nevertheless, he still upholds the doctrine that they move instantaneously[136] which in scholastic terms would imply that the motion of the species would still have to be taken as qualitative alteration rather than local motion. Moreover, though Fracastoro's notion of species has some atomist overtones, he maintains that species are spiritual forms, rather than particles. Corpuscularian overtones are even more apparent in the *Short Tract*. Hobbes seems to suggest that species have a particle-like nature[137], though he never explicitly says that species are corporeal.[138]

In sum, Hobbes adopts important elements of Fracastoro's naturalistic psychology, but employs them in the context of his own kinetic mechanicism.

6. Fracastoro and Hobbes's Later Epistemology

As is well-known, shortly after he composed the *Short Tract*, Hobbes gave up his Fracastorian-inspired species-doctrine[139] and adopted a mediumnistic explana-

[135] II C.8.

[136] *Turrius* 166A: "[species] a rebus momento effluunt, & diffuduntur in orbem, quacunque medium, per quod transeunt, est susceptivum earum". Hobbes expressly denies that species move in an instant and therefore do not move locally (II C.8).

[137] See II C.8.

[138] In any case, Hobbes does certainly not advocate an atomist notion of species. First of all, he rejects atomism in the *Short Tract* (Cf. II C.8: no "*Minimum* in line and time"). This is the reason why Bernhardt, *Court Traité*, 107 states that "Hobbes professe dans le *Short Tract* une philosophie *corpusculaire*, qui ne doit pas être dite *atomiste*". But even Hobbes's corpuscularianism is not that evident, since Hobbes never explicitly identifies species as bodies. Moreover, Bernhardt's argument that already in the *Short Tract* Hobbes equates substances and bodies has already been shown to be invalid. For Hobbes's relation to contemporary atomists, such as Harriot, Digby and Warner, see J. Prins, "Ward's polemic with Hobbes on the sources of his optical theories", *Revue d'Histoire des Sciences* 56 (1993), 199f.

[139] One of the most serious problems facing a notion of substantial species is that of exhaustion. It is difficult to imagine how an object can maintain its material integrity while continually sending out substantial species. As a solution, Hobbes proposes that bodies "refuel" themselves by "converting other bodyes or Species adiacent, into themselves" (II C.8).

tion of light and other sensible qualities.[140] In his later works Hobbes not only drops Fracastorian-inspired species, he also refines his mechanistic approach to human psychology which distinguishes him from Fracastoro. Nevertheless, even Hobbes's later epistemology has some interesting parallels with Fracastoro's doctrine, which proves that naturalism and mechanicism, even in its definitive shape, do not stand as far apart as has been suggested by some.

Fracastoro denies that God, the immaterial substances and substances *qua* substances emit species. According to him, only proper sensible qualities such as colour, heat, smell, taste etc. produce species.[141] He claims that God, immaterial substances and substances *qua* substances can therefore be only indirectly known, via a process of extrapolation on the basis of the species, sent out by the proper sensible qualities. Thus we can have knowledge of God only if we know the meaning of the terms cause, primary, mover and corporeal. If we consider these together, we conclude that God is the incorporeal, primary cause, the *primus motor*.[142] Similarly, in his Objections against Descartes' *Meditationes*, Hobbes denies that we can have an *idea* of either God, our soul or of substances[143], since we can have no sense perception of them. Nevertheless, by

However, Hobbes acknowledges that this solution is not entirely satisfactory: "though the way how this is done, as allmost all the wayes of Nature, be to us not so perceptible" (II C.8). The possibility of "refuelling" had already been put forward by Epicurus, *Letter to Herodotus*, 48.

[140] See *Correspondence*, 38 (Hobbes to William Cavendish, Byfleet 16/26 October 1636): "But whereas I vse the phrases, the light passes, or the colour passes or diffuseth it selfe, my meaning is that the motion is onely in y^{e} medium, and light and colour are but the effects of that motion in y^{e} brayne". The shift from Fracastorian-inspired species to mediumnism, though important, is not as dramatic as it may seem at first sight. As we have already seen, in Hobbes's account the role of the species had already been reduced to conveying motion only. Moreover, Hobbes seems to think that species form a continuous, solid beam emanating from the object (See II C.8, Coroll.). Taken together, these beams already form a kind of solid medium which conveys motion. On Hobbes's optics and theory of vision see J. Prins, "Hobbes on Light and Vision," in *The Cambridge Companion to Hobbes*, ed. T. Sorell (Cambridge, 1996), 129-56.

[141] *Turrius* 166D; 175Aff. In this context, Fracastoro uses the Aristotelian distinction between proper sensibles which are perceived directly by its related proper sense and common sensibles such as figure, motion and magnitude which are only perceived in conjunction with proper sensibles. Cf. Aristotle, *De Anima* II, 6 418 a 7-25.

[142] *Turrius* 175A. "Ita Deum et alia immateriala cognovimus, ita et substantiam ipsam. Siquidem scientes nos, quid sit causa, quid primum, quid motor, quid corporeum, vocavimus quidem Deum, quod esset causa prima, et primus motor, et incorporeum Substantiam autem, scientes, quid sit esse in alio, et non esse, ac videntes oportere nos aut in infinitum ire, aut perveniendum ad aliquid, quod non in alio esset, sed per se subsisteret. Hoc ergo substantiam appellavimus".

[143] OL V, 264.

means of a process of extrapolation, we can rationally conclude that God *exists*.[144] If we proceed from effect to cause and then to the next cause, we "shall at last come to this, that there must be one first mover; that is, a first, and an eternal cause of things; which is that which men mean by the name of God".[145]

A second parallel concerns their critique of scholastic terminology. As we have seen, Fracastoro attacks the scholastic doctrine, according to which the active intellect "illuminates" (*irradiare*) the sensible phantasma in the passive intellect, thus producing the universal concept. He condemns this expression as metaphorical language, which may befit a poet, but which does not belong in philosophy.[146] Hobbes develops this critique, which is quite common to naturalistic philosophers in the renaissance and the seventeenth century[147], into a massive attack on the "metaphoricall speech", linguistic eccentricities and "vain philosophy" of the scholastics, especially in the fourth part of the *Leviathan*.

Further, in his dialogue *Turrius* Fracastoro stresses that the difference between the cognitive faculties of man and animal is only relative.[148] Since animals also have *phantasia* (understood here as the faculty to draw inferences on the basis of particular cases), they can have the same types of reasoning (*discursus*) as we do. Birds, for instance, use a form of ratiocination, which Fracastoro calls the *exemplum*: when a bird sees that its fellow-birds are caught in a net, it tries to flee out of fear that it might share a similar fate.[149] There are, however, two kinds of reasoning animals cannot perform, viz. induction and syllogism, defined by Fracastoro as the deduction of a particular conclusion from universal premises.[150] These types of ratiocination require an intellect (*intellectus*), by which one can draw necessary conclusions from given premises. Another difference between man and animals is that the use of language is unique to man only.[151] Hobbes also accepts that animals have the ability to reason; they can connect means and ends, such as can be seen in the case of the bird that intends to build a nest and tries to find the proper materials for it. Man's faculty of reasoning does not differ from that in animals "except in degree and celerity of thinking".[152] Hobbes also re-

[144] OL V, 260.
[145] L XII (EW III, 96). Hobbes depends here on traditionally scholastic proofs for the existence of God. The *locus classicus* is Thomas Aquinas' discussion of the five *viae* in the beginning of the *Summa Theologiae* Ia, q. 11, a.3.
[146] *Turrius* 176A.
[147] See for example Bacon, *De Augmentis Scientiarum,* in: *The Works,* 475.
[148] The dialogue *Fracastorius* once again offers a different picture. Cf. 210Bff.
[149] *Turrius* 179D.
[150] *Turrius* 185C.
[151] *Turrius* 165A.
[152] DM 353: "nisi gradu et celeritate cogitandi".

stricts the use of language, i.e. the imposition of names, to man alone. Accordingly, also the possibility to acquire science exclusively belongs to man, since science is defined by Hobbes as a "knowledge of all the consequences of *names* appertaining to the subject in hand".[153]

Fracastoro gives an interesting explanation for why frenetic and ecstatic people see things that are not there, such as demons and apparitions of the dead. According to him, these people have a strong imagination that is due to a certain corporeal disposition (usually a melancholic temper). Their imagination not only retains the species of impressive things, such as the ones experienced during a lonely night at the church-yard, but it combines them with other species and diffuses them via the animal spirits to the eyes. Thus one is easily led to believe that the products of the imagination really exist.[154] As is well-known, Hobbes, too, explains all belief in demons and apparitions of the dead as the effects of a strong imagination, which can combine all sorts of retained images, thus creating "spectres", golden mountains etc.[155] In this context, Hobbes does not so much concentrate on the physiological causes, but rather on the psychological factors involved, such as the effects of a strong impression, fear, ignorance, etc.[156]

Fracastoro's *Turrius* propounds a nominalism which Hobbes elaborated in a more radical way. Fracastoro states that if two ideas are conceived as being connected (*coniuncta*), e.g. the idea of table and the idea of red, we give verbal expression to this by connecting the two terms by means of the verb *is* : the table *is* red. The verb "to be" itself is only a linguistic device which helps us form affirmations and negations; it does not correspond to anything in reality.[157] Hobbes defines a proposition as "speech consisting of two names copulated, by which he

[153] L V (EW III, 35).

[154] *Turrius* 198B-C. On the closely related issue of prophesies, *Turrius* and *Fracastorius* contradict each other. According to *Turrius* the fact that prophesies can sometimes come true, is either due to coincidence or to the intervention of a "separate intellect", i.e God or a demon (198D). Although in the *Turrius* both options are left open, Fracastoro strongly emphasises the physiological and psychological factors involved in prophesying, and does not discuss the possibility of divine or demonic intervention. In the *Fracastorius* he claims that the fact that prophesies come true cannot be mere coincidence, but should have a more elevated cause (*causam alteriorem*), namely divine intervention (215C).

[155] Cf. L XLVI (EW III, 664ff.).

[156] Fracastoro's teacher, Pietro Pomponazzi had already worked out a naturalistic programme reducing visions, prophesies etc. to the status of natural, though rather unusual, phenomena, to be explained as the effects of natural (physiological, psychological) cause. See P. Pomponatius, *De Naturalium Effectuum Causis, Sive de Incantationibus* (Basileae 1567 (reprint Hildesheim, 1970).

[157] *Turrius* 171A: "Non enim in re est verbum illud est, aut non est, sed solum extrema in re sunt".

that speaketh signifies he conceives the latter name to be the name of the same thing whereof the former is the name".[158] This connection can be brought about by the verb "to be", but this is not necessary: "There are, or certainly may be, some nations that have no word which answers to our verb *is,* who nevertheless form propositions by the position only of one name after another, as if instead of *man is a living creature,* it should be said *man a living creature*".[159] In other words, quite in line with Fracastoro, Hobbes considers the verb "to be" as a useful but in no way indispensable linguistic device to connect names. Therefore all metaphysical speculation concerning the ontological status of *essentia, esse,* and other terms derived from *esse* or "to be" is superfluous.[160]

Another nominalist trait in Fracastoro is the way he interprets the traditional distinction between concepts that relate directly to things in reality (*intentiones primae*) and concepts that relate to our conception of the things in reality (*intentiones secundae*). Fracastoro claims that the distinction between *genus* and *species* belongs to the second class, and he reduces these notions to more or less conventional names which are of interest to the rhetorician and grammarian rather than to the philosopher.[161] Hobbes makes the same distinction: "some are called names of the *first,* others of the *second intention.* Of the *first intention* are the names of things, a *man, stone, etc.:* of the *second* are the names of names and speeches, as *universal, particular, genus, species, syllogism,* and the like".[162] Hobbes, too, considers "*genus, species, definition, etc.*" to be "names of words and names only and therefore to put *genus* and *species* for things, and *definition* for the nature of any thing, as the writers of *metaphysics* have done, is not right, seeing they be only significations of what we think of the nature of things".[163]

[158] EW I, 30 (DCo III, 1; OL I, 26).

[159] EW I, 31 (DCo III, 1; OL I, 26)..

[160] Cf. L XLVI (EW III, 673-4): "And if it were so, that there were a language without any verb answerable to *est* or *is* or *be*; yet the men that used it would be not a jot the less capable of inferring, concluding, and of all kind of reasoning, than were the Greeks and Latins. But what then would become of these terms, of entity, essence, essential, essentiality, that are derived from it, and of many more that depend on these, applied as most commonly they are? They are therefore no names of things; but signs, by which we make known, that we conceive the consequence of one name or attribute to another".

[161] *Turrius* 192A-B. Cf. E. Cassirer, *Erkenntnisproblem,* 230.

[162] EW I, 20-21 (DCo II, 10; OL I, 18-9).

[163] EW I, 20-21 (DCo II, 10; OL I, 18-9). For the nominalist background to this distinction between *intentiones primae* and *intentiones secundae*, see J. Pinborg, *Logik und Semantik im Mittelalter* (Stuttgart - Bad Canstatt, 1972), 128.

Conclusion

We have seen that even in its ripe phase, Hobbes's mechanistic natural philosophy and epistemology is far from incompatible with Fracastorian naturalism. In the case of the *Short Tract* the parallels between Fracastoro and Hobbes are so close as to suggest a direct influence on Hobbes's doctrine of species and their role in the process of cognition. This also means that contrary to what has been suggested by some, in general renaissance naturalism should be taken seriously as one of the sources of Hobbes's mechanistic philosophy. In this context, the *Short Tract*, now definitively ascribed to Hobbes, offers a unique opportunity to establish the way in which Hobbes dealt with the heritage of renaissance philosophy. The *Short Tract* documents the transition from renaissance naturalism as professed by Telesio, Campanella and Fracastoro to the strict mechanicism of Hobbes's later works.